Road Salts in the Suburban Landscape: Transport, Direct Effects, and Interactions with Other Pollutants

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General Outline

- Uplands
- Storm water Pond
- Stream
The Owings Mills Watershed

Typical Landscape Pattern in Owings Mills
Measurement of ions and metals

- All analyses conducted at the Urban Biogeochemistry laboratory at TU
- Metal analyzed using Inductively coupled mass spectrometry (ICPMS)
- Ion analyzed on ion chromatograph (IC)
- All runs include blanks, duplicates, and standards

Inputs to storm water ponds

\[ y = 0.274x - 34.186 \]

\[ R^2 = 0.96 \]
Biological effects in ponds

- Forest (juvenile & adult habitat)
- Pond (breeding habitat)

Diagram showing migration arrows between forest and pond habitats.

Probability of Breeding Survival Chart:
- Temporarily exposed
- Seasonally exposed
- Temporarily flooded

Chloride (mg/L) vs. Days:
- 650 uS/cm
- 2500 uS/cm
- 5600 uS/cm
Bioassay of the interaction between salt and copper:
- Two-way, completely factorial design
- Green Frog embryos (Lithobates clamitans)
- Cu at six levels (0, 75, 125, 175, 225, 275, and 325 ug/L)
- NaCl at six levels

Movement into soils of storm water ponds
Movement into soils of storm water ponds

![Graph showing movement into soils of storm water ponds](image1)

Movement into soils of storm water ponds

![Graph showing movement into soils of storm water ponds](image2)
Movement into soils of storm water ponds

Changes in soils ion binding capacity
Effects in the stream

Stream study sites
Seasonal changes in Chloride levels

Results of field surveys

\[ y = -0.002x + 0.506 \]

\[ R^2 = 0.137 \]
Laboratory bioassays

![Graph showing average weight gain vs. conductivity (US/cm)]

- Average weight gain at 160 conductivity: x = 62.5
- Average weight gain at 600 conductivity: x = 67.2
- Average weight gain at 2000 conductivity: x = 62.7

Laboratory bioassays

![Graph showing average weight gain vs. conductivity (US/cm)]

- Average weight gain at 160 conductivity: x = 50.8
- Average weight gain at 2000 conductivity: x = 56.7
Conclusion

- Road deicers are reaching streams and altering water chemistry, despite modern storm water management
- Road deicers are interacting with other pollutants
- Road deicers are having toxic effects